DSL on CNR for the Home Server PC

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Overview

The "home server" PC provides a central location through which all of the networked PCs within the home can communicate to the outside world. To serve as a server, this PC must support Wide Area Network (WAN) technologies such as DSL (Digital Subscriber Line), cable modem, or V.90, in addition to a Local Area Network (LAN) technology, such as home phoneline or wireless networking.

As the demand for DSL continues to grow, one possible home server configuration supports the combination of DSL and V.90 technologies with home phoneline networking. Each of these technologies uses the telephone line RJ-11 jack to communicate. When all three of these technologies are integrated onto a single card, the OEM or system integrator can ship a single product that supports a DSL or V.90 WAN, plus a home phoneline LAN, without the need to provide additional telephone cables, RJ-11 "Y" connectors, and filters.The integration of these technologies on a single card reduces the potential support costs associated with implementing the same technologies on individual cards.

The CNR (Communication and Networking Riser) specification provides a flexible and cost-effective way to implement DSL, V.90 modem, and home phoneline networking in a home server PC. CNR incorporates multiple interfaces on a single connector, and as a result, several communication and networking building blocks can be easily incorporated onto a single card. This in turn provides OEMs, manufacturers, and system integrators with the flexibility to integrate home server PC functionality as a value-add, at a price point that is potentially much lower than what can be achieved using traditional PCI expansion cards.

Multiple Interfaces

As Figure 1 shows, CNR technology flexibly supports a variety of WAN and LAN technologies through its various interfaces. The interfaces included on CNR include the Audio Codec '97 (AC '97), System Management Bus (SMBus), Universal Serial Bus (USB), and either Intel's LAN Connect Interface (LCI) or the Media Independent Interface (MII).

These interfaces allow flexible combinations of audio, DSL modems, cable modems, V.90 modems, 10/100 Ethernet LAN, home phoneline networking, or wireless networking all to coexist on a single card, based on the requirements of specific platforms. In today's PCs the controller side of each of these interfaces is typically integrated into the core logic chipset.

As shown in Figure 1, the V.90 analog modem is supported through the AC '97 Interface. Home phoneline networking is supported through the LCI Interface on Type A CNR connectors or the MII Interface on Type B connectors. Though DSL does not have a dedicated interface, it is easily supported through the USB Interface.

The Communications and Networking Riser Interface

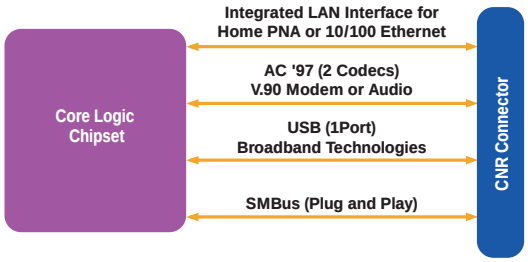

Figure 1

DSL Modem on CNR

CNR can easily support a DSL modem using the existing USB interface and USB-based DSL silicon. OEMs, system integrators, and CNR manufacturers do not need to create a new interface or wait for the silicon development on a new interface.

As shown in Figure 2, DSL modems typically use an architecture that includes a bridge device between a common bus (e.g., PCI, MII, or USB) and a Digital Signal Processor (DSP). The DSP

(continued)

DSL on CNR Architecture for a Home Server PC

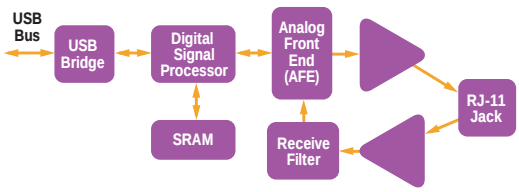

Figure 2

then communicates through a separate interface to an Analog Front End (AFE). The final blocks in this architecture include the Line Driver and Receive Filters.

In the DSL on CNR architecture, the data to be transmitted over the DSL modem is transferred to the PC's USB controller. It is then formatted and sent to the USB bridge device on the CNR, where the data is extracted and sent to the DSP. The DSP then takes this data and applies the appropriate encoding and modulation techniques and transmits it to the AFE. The AFE device essentially consists of a Digital to Analog Converter (DAC). This DAC then converts the encoded and modulated data from the DSP and turns it into an analog signal which is finally sent to the Line Driver for amplification and out to the telephone line and to the telephone company Central Office.

Data that is received via the telephone line is passed through the receive amplifier and receive filter to the AFE. The AFE then digitizes the encoded and modulated data using an Analog to Digital Converter (ADC). The digitized data is then passed into the DSP where it is demodulated and decoded and passed to the USB bridge. Finally, the USB bridge device formats the data for transmission over the USB Interface and to the PC's USB controller where it is received and sent back to the system memory for use by the PC.

Summary

CNR provides OEMs and system integrators with a flexible and cost-effective solution for implementing new communications and networking technologies. As DSL modems and home networking become more popular in the consumer market segment, the "home server" PC, integrating DSL, V.90, and home phoneline technologies, provide a way for networked home PCs to share a DSL connection, all through the use of a single RJ-11 connector.

CNR technology provides a more cost-effective integrated solution by providing an inexpensive method for implementing DSL, V.90, and home phoneline networking technologies. Implementing server functionality is simply a matter of integrating a single riser card that provides a single RJ-11 jack, eliminating the requirement for additional phone cable, Y connectors, and specialized filters. In addition, the solution uses industry standard silicon building block from a variety of manufacturers.

While CNR technology provides a lower cost, time-to-market solution for OEMs, CNR manufacturers and system integrators, it can also help simplify the in-home deployment of shared broadband connections, providing another great way to enhance the PC user experience.

More Info

The Intel® CNR Web site includes press releases, industry links, and downloadable information for OEMs, system integrators, and CNR manufacturers. Visit http://developer.intel.com/technology/cnr/download.htm to download version 1.1 of the CNR Specification. Version 1.0 of the CNR System Design Guide in Adobe Acrobat* format is available at http://developer.intel.com/technology/cnr/design_download.htm.

For an overview of the benefits of CNR for developers, see the article CNR Card Offers Motherboard Expansion by K.L. Yeung in the May 2000 *Intel Developer Update* at http://developer.intel.com/update/issue/idu0500.htm.

For information on home phoneline networking, visit www.homepha.org.

Author Bio

Brad A. Barmore is a PC audio & communications architect in the OEM Platform Solutions Division (OPSD) in the Intel Desktop Platform Group. His industry contributions include authorship of the Communications and Networking Riser (CNR) Specification and co-authorship of the Audio/Modem Riser (AMR) Specifications. In addition, Brad continues to be the primary architect of the audio and modem subsystems for OPSD's desktop PC motherboards. He holds patents in audio circuitry and has multiple patents pending in the area of PC riser technologies. He graduated from Washington State University in 1986 with a B.S. in electrical engineering.

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